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Application of Rejection-Sampling Theory to Particle Injection in PIC/VSIM Simulations DANIEL MAIN, JOHN CARY, TOM JENKINS, NATE CROSSETTE, SERGEY AVERKIN, Tech-X Corporation — A particle injection boundary condition for PIC simulations representing an infinite plasma beyond a boundary has been implemented in VSIM and is presented here. This boundary condition allows the simulation of a small part of a much larger physical plasma. Our particular application is to determine the interaction of a plasma with a material wall, which requires injection of new particles at the opposite boundary. Because the computational boundary is physically artificial, one goal of this work is to eliminate the formation of sheaths at the injection boundary (since no sheath would form in the physical situation). Therefore, all particles moving toward the boundary are absorbed while the emitted particles are a drifting population which mimics the population already present. To smoothly transition the emitted particles into the simulation domain in VSIM, the incoming particles at the wall correspond to a uniform, thermal plasma with some drift corresponding to the losses at the wall. In this presentation, we discuss a novel method of introducing new particles at a boundary chosen from the correct flux-conserving probability distribution function using Rejection Sampling theory. We show that by emitting particles correctly at the boundary, and by choosing a particular value for the drift velocity, the build-up of sheaths at the boundary can be minimized.

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